

EXHAUST SYSTEM AND INTAKE MANIFOLD

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EXHAUST SYSTEM

GENERAL INFORMATION

The basic exhaust system consists of an engine exhaust manifold, exhaust pipe with oxygen sensor, catalytic converter, exhaust heat shield(s), muffler and exhaust tailpipe (Fig. 1).

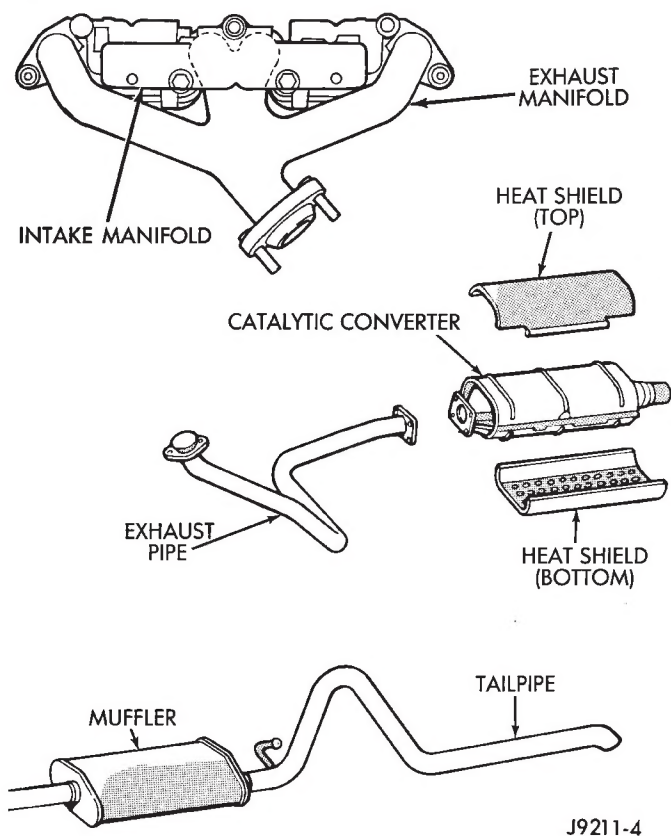


Fig. 1 Typical Exhaust System

The exhaust system uses a single muffler with a single monolithic-type catalytic converter.

The 4.0L engines use a seal between the engine exhaust manifold and exhaust pipe to assure a tight seal and strain free connections.

The exhaust system must be properly aligned to prevent stress, leakage and body contact. If the system contacts any body panel, it may amplify objec-

tionable noises originating from the engine or body.

When inspecting an exhaust system, critically inspect for cracked or loose joints, stripped screw or bolt threads, corrosion damage and worn, cracked or broken hangers. Replace all components that are badly corroded or damaged. DO NOT attempt to repair.

When replacement is required, use original equipment parts (or their equivalent). This will assure proper alignment and provide acceptable exhaust noise levels.

CAUTION: Avoid application of rust prevention compounds or undercoating materials to exhaust system floor pan exhaust heat shields. Light overspray near the edges is permitted. Application of coating will result in excessive floor pan temperatures and objectionable fumes.

CATALYTIC CONVERTER

The stainless steel catalytic converter body is designed to last the life of the vehicle. Excessive heat can result in bulging or other distortion, but excessive heat will not be the fault of the converter. If unburned fuel enters the converter, overheating may occur. If a converter is heat-damaged, correct the cause of the damage at the same time the converter is replaced. Also, inspect all other components of the exhaust system for heat damage.

Unleaded gasoline must be used to avoid contaminating the catalyst core.

EXHAUST HEAT SHIELDS

Exhaust heat shields are needed to protect both the vehicle and the environment from the high temperatures developed by the catalytic converter. The catalytic converter releases additional heat into the exhaust system. Under severe operating conditions, the temperature increases in the area of the con-

verter. Such conditions can exist when the engine misfires or otherwise does not operate at peak efficiency.

DO NOT remove spark plug wires from plugs or by any other means short out cylinders. Failure of the catalytic converter can occur due to a temperature increase caused by unburned fuel passing through the converter.

DO NOT allow the engine to operate at fast idle for extended periods (over 5 minutes). This condition may result in excessive temperatures in the exhaust system and on the floor pan.

EXHAUST SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSE	CORRECTION
EXCESSIVE EXHAUST NOISE	1. Leaks at pipe joints. 2. Burned or blown-out muffler. 3. Burned or rusted-out exhaust pipe. 4. Exhaust pipe leaking at manifold flange. 5. Exhaust manifold cracked or broken. 6. Leak between exhaust manifold and cylinder head. 7. Restriction in muffler or tail pipe.	1. Tighten clamps at leaking joints. 2. Replace muffler assembly. Check exhaust system. 3. Replace exhaust pipe. 4. Tighten connection attaching nuts. 5. Replace exhaust manifold. 6. Tighten exhaust manifold to cylinder head stud nuts or bolts. 7. Remove restriction, if possible. Replace muffler or tail pipe, as necessary.
LEAKING EXHAUST GASES	1. Leaks at pipe joints. 2. Damaged or improperly installed gaskets.	1. Tighten clamps at leaking joints. 2. Replace gaskets, as necessary.
ENGINE HARD TO WARM UP OR WILL NOT RETURN TO NORMAL IDLE	1. Blocked crossover passage in intake manifold. 2. Thermostat broken.	1. Remove restriction or replace intake manifold. 2. Replace thermostat.

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SERVICE PROCEDURES

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EXHAUST PIPE—XJ VEHICLES

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

REMOVAL

- (1) Raise and support the vehicle.
- (2) Saturate the bolts and nuts with heat valve lubricant (Fig. 1). Allow 5 minutes for penetration.

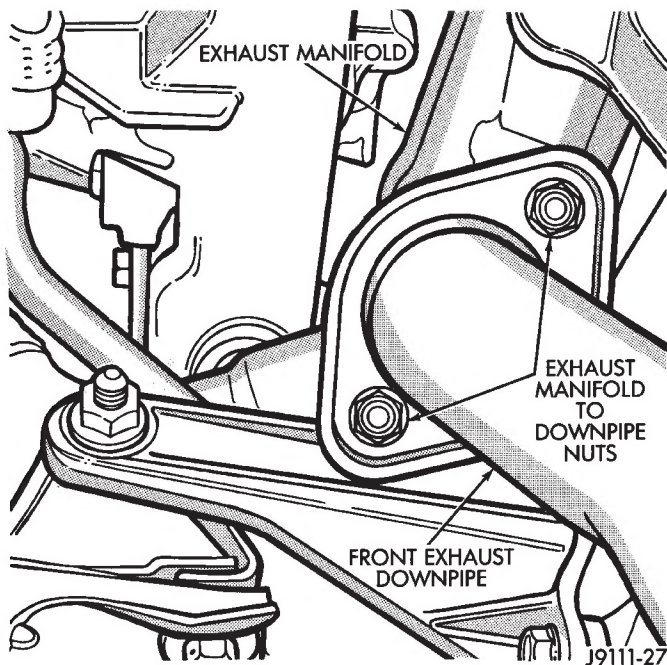


Fig. 1 Exhaust Pipe-to-Engine Exhaust Manifold Nuts

- (3) Remove the oxygen sensor from the exhaust pipe (Fig. 2).

- (4) Disconnect the exhaust pipe from the engine exhaust manifold. Discard the seal (4.0L engine, only).

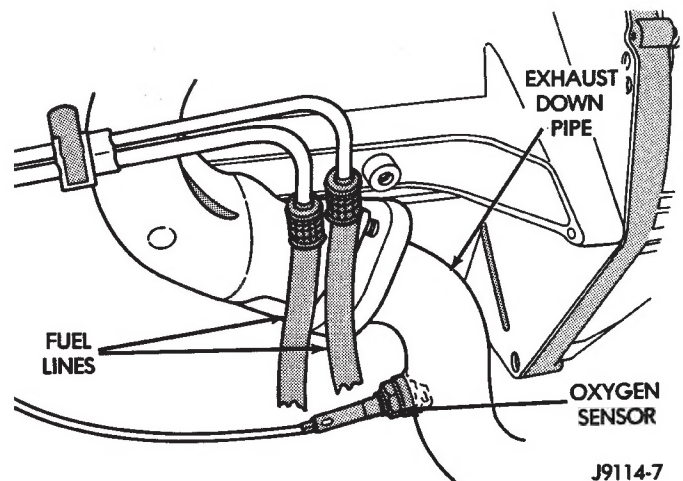


Fig. 2 Oxygen Sensor

- (5) Support the transmission and remove the rear crossmember.

- (6) Remove the damp nuts and damp (Fig. 3). To remove the exhaust pipe from the catalytic converter, apply heat until the metal becomes cherry red. Disconnect the exhaust pipe from the catalytic converter (Fig. 3). Remove the exhaust pipe.

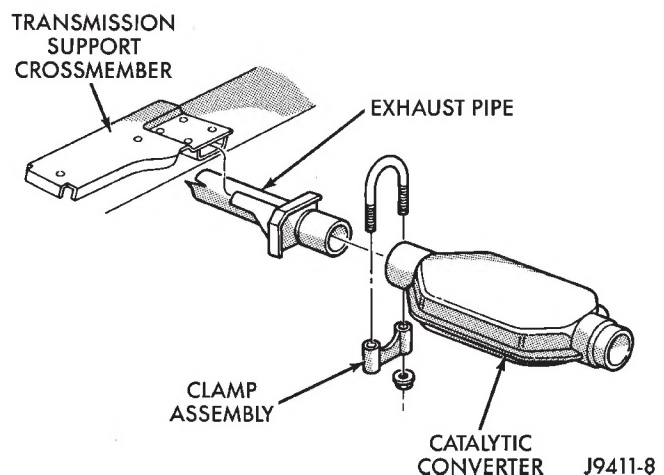


Fig. 3 Exhaust Pipe-to-Catalytic Converter Connection

INSTALLATION

(1) Assemble exhaust pipe to manifold and catalytic converter loosely to permit proper alignment of all parts.

(2) Use a new clamp and tighten the nuts to 61 N·m (45 ft. lbs.) torque.

(3) Connect the exhaust pipe to the engine exhaust manifold. Install a new seal between the exhaust manifold and the exhaust pipe (4.0L engine, only). Tighten the nuts to 31 N·m (23 ft. lbs.) torque (Fig. 1).

(3) Install the rear crossmember. Tighten the crossmember-to-sill bolts to 41 N·m (30 ft. lbs.) torque. Remove the support from the transmission.

(4) Coat the oxygen sensor with anti-seize compound. Install the sensor and tighten the nut to 48 N·m (35 ft. lbs.) torque.

(5) Lower the vehicle.

(6) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

EXHAUST PIPE—YJ VEHICLES

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

REMOVAL

(1) Raise and support the vehicle.

(2) Saturate the bolts and nuts with heat valve lubricant (Fig. 4). Allow 5 minutes for penetration.

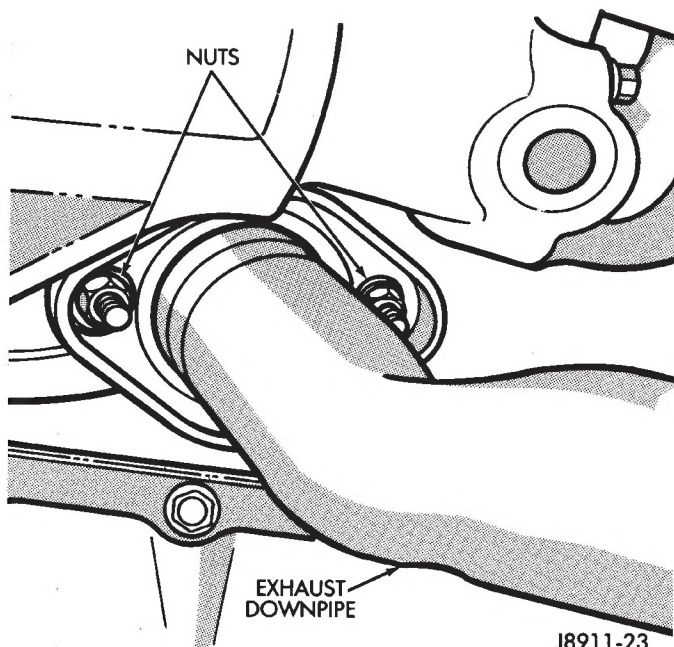


Fig. 4 Exhaust Pipe-to-Engine Exhaust Manifold Bolts and Nuts

(3) Remove the oxygen sensor from the exhaust pipe (Fig. 2).

(4) Disconnect the exhaust pipe from the engine exhaust manifold.

(5) Disconnect the exhaust pipe from the catalytic converter and slide the pipe out of the transmission torque arm insulator (Fig. 5). Remove the exhaust pipe.

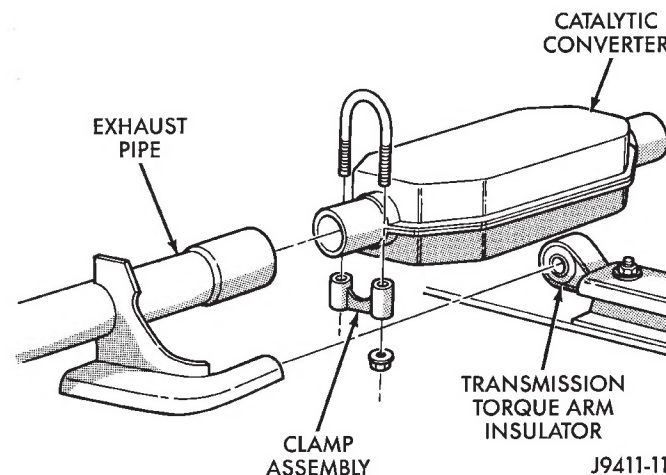


Fig. 5 Exhaust Pipe-to-Catalytic Converter Connection—YJ Vehicles

INSTALLATION

(1) Slide the exhaust pipe into the transmission torque arm insulator and onto the catalytic converter (Fig. 5).

(2) Clean the mating surface of the engine exhaust manifold flange.

(3) Connect the exhaust pipe to the engine exhaust manifold using new nuts. DO NOT tighten the nuts.

(4) Align the exhaust pipe.

(5) Use a new clamp at the exhaust pipe to catalytic converter connection and tighten the nuts to 61 N·m (45 ft. lbs.) torque.

(6) Tighten the exhaust pipe-to-engine exhaust manifold nuts to 31 N·m (23 ft. lbs.) torque.

(7) Coat the oxygen sensor with anti-seize compound. Install the sensor and tighten the nut to 48 N·m (35 ft. lbs.) torque.

(8) Lower the vehicle.

(9) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

CATALYTIC CONVERTER

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the clamp from the catalytic converter and muffler connection (Fig. 6).

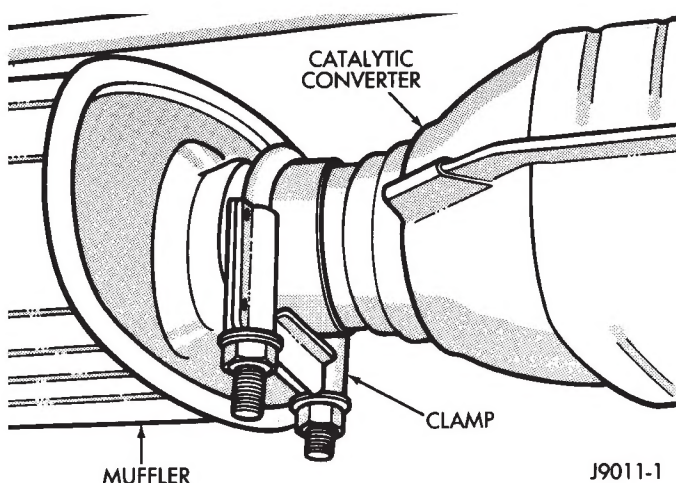


Fig. 6 Catalytic Converter-to-Muffler Connection

(3) Heat the catalytic converter and muffler connection with an oxyacetylene torch until the metal becomes cherry red.

(4) While the metal is still cherry red, twist the muffler assembly back and forth to separate it from the catalytic converter.

(5) Disconnect the exhaust pipe from the catalytic converter (Figs. 3 and 5). If needed, heat up the pipes to separate.

INSTALLATION

(1) Connect the catalytic converter to the exhaust pipe (Figs. 3 and 5). Use a new clamp and tighten the nuts to 61 N·m (45 ft. lbs.) torque.

(2) Install the muffler onto the catalytic converter until the alignment tab is inserted into the alignment slot.

(3) Install a new clamp at the muffler and catalytic converter connection (Fig. 6). Tighten the clamp nuts to 61 N·m (45 ft. lbs.) torque.

(4) Lower the vehicle.

(5) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

MUFFLER AND EXHAUST TAILPIPE—XJ VEHICLES

All original equipment exhaust systems are manufactured with the exhaust tailpipe welded to the muffler. Service replacement mufflers and exhaust tailpipes are either clamped together or welded together.

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the front muffler clamp from the catalytic converter and muffler connection (Fig. 6).

(3) Remove the rear exhaust tailpipe hanger clamp (Fig. 7) and remove the exhaust tailpipe from the front exhaust tailpipe hanger (Fig. 8).

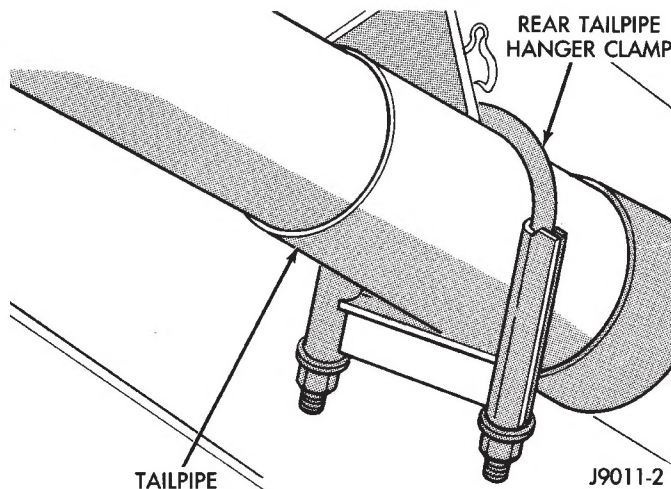


Fig. 7 Rear Exhaust Tailpipe Hanger Clamp

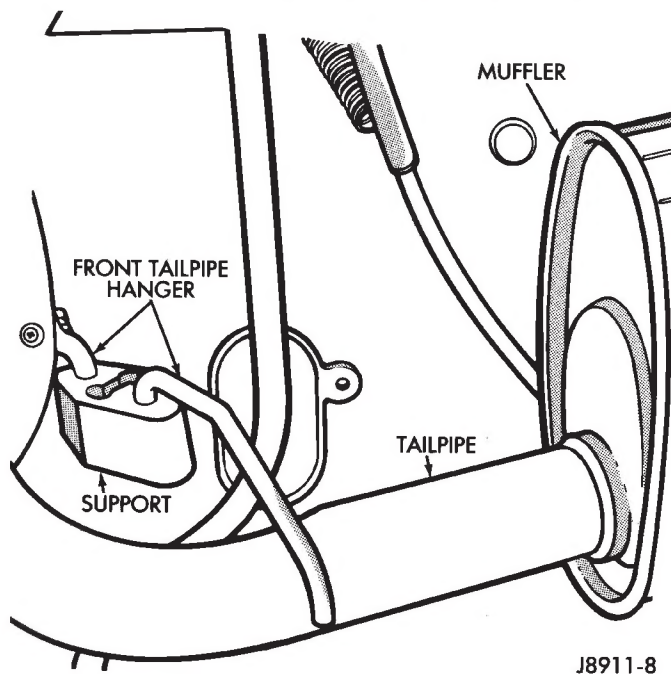


Fig. 8 Front Exhaust Tailpipe Hanger

(4) Heat the catalytic converter-to-muffler connection with an oxyacetylene torch until the metal becomes cherry red.

(5) While the metal is still cherry red, remove the exhaust tailpipe/muffler assembly from the catalytic converter.

(6) Remove the exhaust tailpipe from the muffler:

- To remove an original equipment exhaust tailpipe/muffler combination, cut the exhaust tailpipe close to the muffler. Collapse the part remaining in the muffler and remove.
- To remove a service exhaust tailpipe/muffler combination, apply heat until the metal becomes cherry red. Remove the exhaust tailpipe/muffler clamp and twist the exhaust tailpipe out of the muffler.

INSTALLATION

- (1) Install the muffler onto the catalytic converter. Install the clamp and tighten the nuts finger tight.
- (2) Install the exhaust tailpipe into the rear of the muffler.
- (3) Install the exhaust tailpipe/muffler assembly on the rear exhaust tailpipe hanger. Make sure that the exhaust tailpipe has sufficient clearance from the floor pan.
- (4) Install the remaining clamps and the front exhaust tailpipe hanger.
- (5) Tighten the nuts on the muffler-to-catalytic converter clamp to 61 N·m (45 ft. lbs.) torque (Fig. 6). Tighten the nuts on the rear exhaust tailpipe clamp to 14 N·m (10 ft. lbs.) torque (Fig. 7).
- (6) Lower the vehicle.
- (7) Start the engine and inspect for exhaust leaks and exhaust system contact with the body panels. Adjust the alignment, if needed.

MUFFLER AND EXHAUST TAILPIPE—YJ VEHICLES

All original equipment exhaust systems are manufactured with the exhaust tailpipe welded to the muffler. Service replacement mufflers and exhaust tailpipes are clamped together.

WARNING: IF TORCHES ARE USED WHEN WORKING ON THE EXHAUST SYSTEM, DO NOT ALLOW THE FLAME NEAR THE FUEL LINES.

REMOVAL

- (1) Raise the vehicle and support the rear of the vehicle by the side rails and allow the axle to hang free.
- (2) Remove the front muffler clamp from the catalytic converter and muffler connection (Fig. 6).
- (3) Remove the exhaust tailpipe hanger/bracket (Fig. 9).
- (4) Remove the exhaust tailpipe from the front exhaust tailpipe hanger (Fig. 10).
- (5) Heat the converter-to-muffler connection with an oxyacetylene torch until the metal becomes cherry red.
- (6) While the metal is still cherry red, place a block of wood against the front of the muffler and drive the muffler rearward to disengage.
- (7) Remove the exhaust tailpipe/muffler assembly.
- (8) Remove the exhaust tailpipe from the muffler:

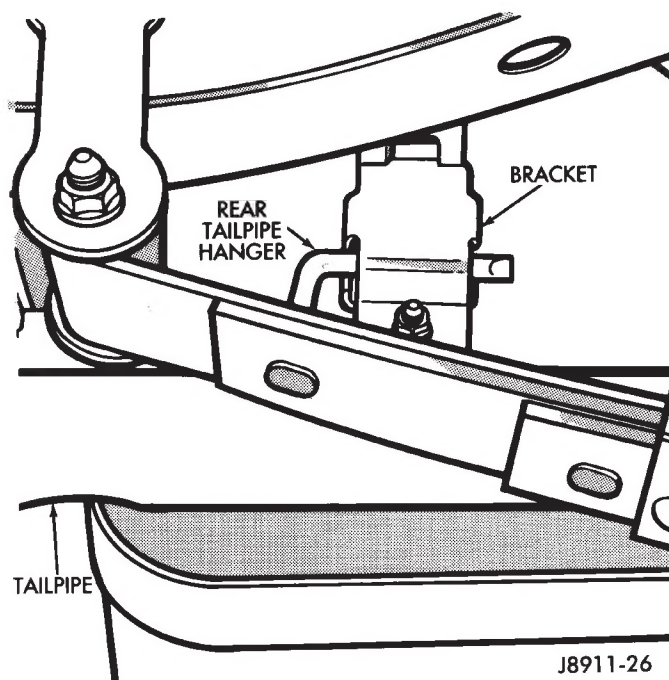


Fig. 9 Rear Exhaust Tailpipe Hanger/Bracket

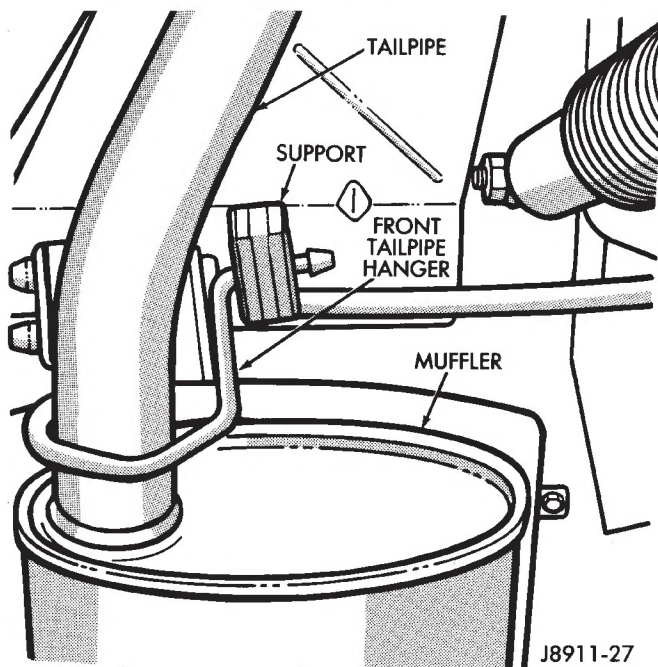


Fig. 10 Front Exhaust Tailpipe Hanger

- To remove an original equipment exhaust tailpipe/muffler combination, cut the exhaust tailpipe close to the muffler. Collapse the part remaining in the muffler and remove.
- To remove a service exhaust tailpipe/muffler combination, remove the exhaust tailpipe/muffler clamp. Heat the exhaust tailpipe-to-muffler connection with an oxyacetylene torch until the metal becomes cherry red. While the metal is still cherry red, twist the exhaust tailpipe out of the muffler.

INSTALLATION

(1) Install the muffler onto the catalytic converter outlet. Ensure that the locator on the converter aligns with the notch on the muffler, if so equipped. Install the clamp and tighten the nuts finger tight.

(2) Install the exhaust tailpipe into the muffler outlet. Ensure that the locator on the exhaust tailpipe aligns with the notch on the muffler, if so equipped. Install the clamp and tighten the nuts finger tight.

(3) Install the front exhaust tailpipe supports and the rear exhaust tailpipe hanger. Ensure that the exhaust tailpipe has sufficient clearance from the floor pan and shields.

(4) Tighten the nuts on the muffler-to-catalytic converter and the muffler-to-exhaust tailpipe clamps to 61 N·m (45 ft. lbs.) torque.

(5) Lower the vehicle.

(6) Start the engine and inspect for exhaust leaks and contact with the body panels and shields.

ENGINE EXHAUST MANIFOLD—2.5L ENGINE

REMOVAL

(1) Disconnect the battery negative cable.

(2) Remove all components attached to the intake manifold.

(3) Raise the vehicle.

(4) Disconnect the exhaust pipe from the engine exhaust manifold.

(5) Lower the vehicle.

(6) Remove fasteners 2 through 5 and remove the intake manifold (Fig. 11).

(7) Remove fasteners 1, 6 and 7 and remove the engine exhaust manifold (Fig. 11).

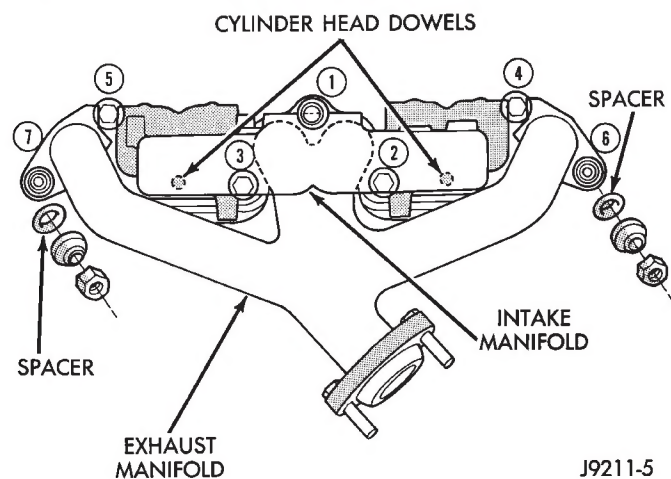


Fig. 11 Intake/Engine Exhaust Manifold Installation (2.5L Engine)

CLEANING

Clean the intake and engine exhaust manifolds and cylinder head mating surfaces. **DO NOT allow for-**

ign material to enter either the intake manifold or the ports in the cylinder head.

INSTALLATION

(1) Install a new intake manifold gasket over the alignment dowels on the cylinder head.

(2) Install the engine exhaust manifold assembly. **Exhaust manifold must be centrally located over the end studs and spacer (Fig. 11).**

(3) Tighten bolt No.1 to 41 N·m (30 ft. lbs.) torque (Fig. 11).

(4) Install the intake manifold on the cylinder head dowels (Fig. 11).

(5) Install bolts 2 through 5 (Fig. 11). Tighten these bolts to 31 N·m (23 ft. lbs.) torque.

(6) Install new engine exhaust manifold spacers over the engine exhaust manifold mounting studs in the cylinder head (Fig. 11).

(7) Tighten nuts 6 and 7 to 31 N·m (23 ft. lbs.) torque (Fig. 11).

(8) Install all components to the intake manifold.

(9) Raise the vehicle.

(10) Connect the exhaust pipe to the engine exhaust manifold. Tighten the bolts to 31 N·m (23 ft. lbs.) torque.

(11) Lower the vehicle.

(12) Connect the battery negative cable.

(13) Start the engine and check for leaks.

ENGINE EXHAUST MANIFOLD—4.0L ENGINE

The intake and engine exhaust manifolds on the 4.0L engine must be removed and installed together. The manifolds use a common gasket at the cylinder head.

Refer to Intake Manifold—4.0L Engine in this section for the proper removal and installation procedures.

INTAKE MANIFOLD—2.5L ENGINE

REMOVAL

(1) Disconnect the battery negative cable.

(2) Remove the air inlet hose from the throttle body and air cleaner.

(3) Loosen the accessory drive belt tension and remove the belt from the power steering pump.

(4) Remove the power steering pump and brackets from the water pump and intake manifold. Support power steering pump and bracket with mechanics wire attached to the radiator upper crossmember.

(5) Remove the fuel tank filler cap to relieve the fuel tank pressure.

(6) Install the fuel tank filler cap.

(7) Disconnect fuel supply and return tube from the fuel rail (refer to Group 14, Fuel System - Quick Connect Fittings).

(8) Disconnect the accelerator cable from the throttle body and the holddown bracket.

CAUTION: When disconnecting the cruise control connector at the throttle body, **DO NOT** pry the connector off with pliers or screwdriver. Use finger pressure only. Prying the connector off could break it.

(9) Disconnect the electrical connectors. Pull the harnesses away from the manifold.

- The throttle position sensor.
- The idle speed control motor.
- The coolant temperature sensor at the thermostat.
- The manifold air temperature sensor at the intake manifold.
- The fuel injectors.
- The oxygen sensor.

(10) Disconnect the crankcase ventilation (CCV) vacuum hose and manifold absolute pressure (MAP) sensor vacuum hose connector at the intake manifold.

(11) Disconnect vacuum hose from vacuum port on the intake manifold.

(12) Disconnect CCV hose at the cylinder head cover (Fig. 12).

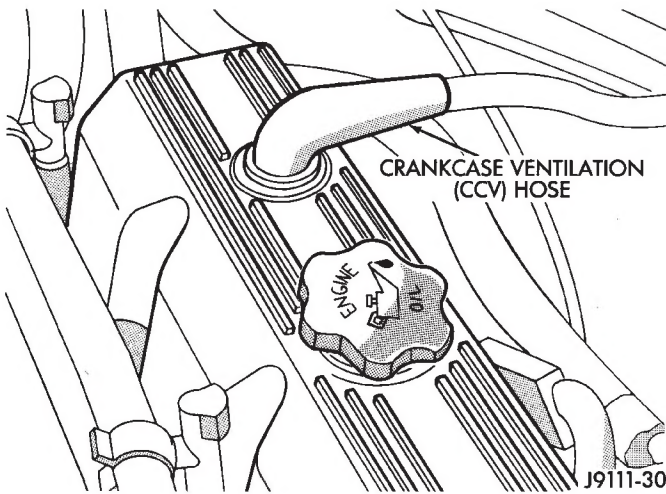


Fig. 12 Crankcase Ventilation (CCV) Hose (2.5L Engine)

(13) Remove the molded vacuum harness.

(14) Disconnect the vacuum brake booster hose at the intake manifold.

(15) Remove bolts 2 through 5 securing the intake manifold to the cylinder head (Fig. 11). Slightly loosen bolt No.1 and nuts 6 and 7.

(16) Remove the intake manifold and gaskets. Drain the coolant from the manifold.

CLEANING

Clean the intake manifold and cylinder head mating surfaces. **DO NOT** allow foreign material to enter either the intake manifold or the ports in the cylinder head.

INSTALLATION

(1) Install the new intake manifold gasket over the locating dowels.

(2) Position the manifold in place and finger tighten the mounting bolts.

(3) Tighten the fasteners in sequence and to the specified torque (Fig. 11).

- Fastener No.1—Tighten to 41 N·m (30 ft. lbs.) torque.

- Fasteners Nos.2 through 7—Tighten to 31 N·m (23 ft. lbs.) torque.

(4) Connect the fuel return and supply tube to the connector next to the fuel rail. Push them into the fitting until a click is heard. Verify that the connections are complete.

- First, ensure only the retainer tabs protrude from the connectors.

- Second, pull out on the fuel tubes to ensure they are locked in place.

(5) Connect the molded vacuum hoses to the vacuum port on the intake manifold and the cylinder head cover.

(6) Connect the electrical connectors.

- The throttle position sensor.
- The automatic idle speed control motor.
- The coolant temperature sensor at the thermostat housing.
- The fuel injectors.
- The air manifold temperature sensor.
- The oxygen sensor.

(7) Connect the CCV vacuum hose and MAP sensor vacuum hose connectors to the throttle body.

(8) Install the power steering pump and bracket assembly to the water pump and intake manifold.

(9) Connect the accelerator cable and cruise control cable to the holddown bracket and the throttle arm.

CAUTION: Ensure that the accessory drive belt is routed correctly. Failure to do so can cause the water pump to turn in the opposite direction resulting in engine overheating. Refer to Group 7, Cooling System for the proper procedure.

(10) Tension the accessory drive belt. Refer to Group 7, Cooling System for the proper procedure.

(11) Connect the air inlet hose to the throttle body and the air cleaner.

(12) Connect the battery negative cable.

(13) Start the engine and check for leaks.

INTAKE MANIFOLD—4.0L ENGINE

The intake and engine exhaust manifolds on the 4.0L engine must be removed and installed together. The two manifolds use a common gasket at the cylinder head.

REMOVAL

(1) Disconnect the battery negative cable.

(2) Remove air cleaner inlet hose from throttle plate assembly.

(3) Remove the air cleaner assembly.

(4) Remove the throttle cable, cruise control cable (if equipped) and the transmission line pressure cable.

(5) Disconnect all electrical connectors on the intake manifold.

(6) Disconnect and remove the fuel supply and return lines from the fuel rail assembly (refer to Group 14, Fuel System).

(7) Loosen the accessory drive belt (refer to Group 7, Cooling System). Loosen the tensioner.

(8) Remove the power steering pump and bracket from the intake manifold and set aside.

(9) Remove the fuel rail and injectors (refer to Group 14, Fuel System).

(10) Raise the vehicle.

(11) Disconnect the exhaust pipe from the engine exhaust manifold. Discard the seal.

(12) Lower the vehicle.

(13) Remove the intake manifold and engine exhaust manifold.

CLEANING

Clean the mating surfaces of the cylinder head and the manifold if the original manifold is to be installed.

If the manifold is being replaced, ensure all the fitting, etc. are transferred to the replacement manifold.

INSTALLATION

(1) Install a new exhaust/intake manifold gasket over the alignment dowels on the cylinder head.

(2) Position the engine exhaust manifold to the cylinder head. Install fastener No.3 and finger tighten at this time (Fig. 13).

(3) Install intake manifold on the cylinder head dowels.

(4) Install washers and fasteners Nos.1, 2, 4, 5, 8, 9, 10 and 11 (Fig. 13).

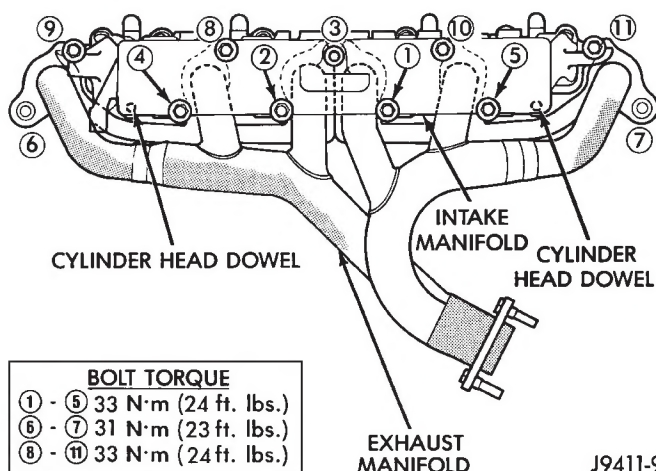
(5) Install washers and fasteners Nos.6 and 7 (Fig. 13).

(6) Tighten the fasteners in sequence and to the specified torque (Fig. 13).

- Fasteners Nos.1 through 5—Tighten to 33 N·m (24 ft. lbs.) torque.

- Fasteners Nos.6 and 7—Tighten to 31 N·m (23 ft. lbs.) torque.

- Fasteners Nos.8 through 11—Tighten to 33 N·m (24 ft. lbs.) torque.



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Fig. 13 Intake/Engine Exhaust Manifold Installation (4.0L Engine)

(7) Install the fuel rail and injectors.

(8) Install the power steering pump and bracket to the intake manifold. Tighten the belt to specification. Refer to Group 7, Cooling System for the proper procedures.

(9) Install the fuel supply and return lines to the fuel rail assembly. **Before connecting the fuel lines to the fuel rail replace the O-rings in the quick-connect fuel line couplings.** Refer to Group 14, Fuel System for the proper procedure.

(10) Connect all electrical connections on the intake manifold.

(11) Connect the vacuum connector on the intake manifold and install it in the bracket.

(12) Install throttle cable, cruise control cable (if equipped).

(13) Install the transmission line pressure cable (if equipped). Refer to Group 21, Transmission for the adjustment procedures.

(14) Install air cleaner assembly.

(15) Connect air inlet hose to the throttle plate assembly.

(16) Raise the vehicle on a side mounted hoist.

(17) Using a new seal, connect the exhaust pipe to the engine exhaust manifold. Tighten the bolts to 31 N·m (23 ft. lbs.) torque.

(18) Lower the vehicle.

(19) Connect the battery negative cable.

(20) Start the engine and check for leaks.

TORQUE SPECIFICATIONS

Description	Torque
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Catalytic Converter/Exhaust Pipe Clamp Nuts	61 N•m (45 ft. lbs.)
Crossmember-to-Sill Bolts	41 N•m (30 ft. lbs.)
Exhaust Pipe-to-Manifold Nuts	31 N•m (23 ft. lbs.)
Exhaust Manifold Bolt #1 2.5L Engine	41 N•m (30 ft. lbs.)
Exhaust Manifold Bolts #2-5 2.5L Engine	31 N•m (23 ft. lbs.)
Exhaust/Intake Manifold Nut/ Bolts #1-5 & #8-11 4.0L Engine	33 N•m (24 ft. lbs.)

Description	Torque
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Exhaust Manifold Nuts #6 & 7 2.5L Engine	31 N•m (23 ft. lbs.)
Exhaust Manifold Nuts #6 & 7 4.0L Engine	31 N•m (23 ft. lbs.)
Intake Manifold Bolt #1 2.5L Engine	41 N•m (30 ft. lbs.)
Intake Manifold Bolts #2-5 2.5L Engine	31 N•m (23 ft. lbs.)
Muffler-to-Catalytic Converter Clamp Nuts	61 N•m (45 ft. lbs.)
Oxygen Sensor	48 N•m (35 ft. lbs.)
Rear Tail Pipe Clamp Nuts	14 N•m (10 ft. lbs.)

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